Claims

1. Apparatus for the production of pocketed coil springs, comprising

a coiling section in which a coil is formed from wire fed to the coiling section, said coiling section comprising coiling elements whose position and/or orientation determines the form of said coil, and

an encapsulation section in which the coil is inserted between juxtaposed sheets of material and in which the sheets of material are joined together to form a pocket enclosing the coil,

wherein said apparatus further comprises programmable control means operably linked to said coiling elements thereby to control the position and/or orientation thereof.

2. Apparatus as claimed in Claim 1, wherein the programmable control means comprises a programmable logic controller by which computer-numerical-control of the coiling section is achieved.

3. Apparatus as claimed in Claim 2, wherein the logic controller actuates drive means by which the positions and/or orientations of the coiling elements can be altered.

4. Apparatus as claimed in Claim 3, wherein said drive means comprises three motors, one for the wire feed rolls, one for a coiling element which controls the diameter of the spring, and one for a coiling element which controls the pitch of the spring.

5. Apparatus as claimed in any preceding claim, wherein the control means stores data arrays or tables which determine the position of the axes of the coiling elements in relation to the position of the feed roller axis.

6. Apparatus as claimed in any preceding claim, wherein one or more electromagnets are mounted at the exit of the coiling unit, said one or more electromagnets engaging each spring as it leaves the coiling unit, said spring being mechanically drawn away from said one

~~or more electromagnets as said spring is conveyed to the encapsulation section.~~

7. Apparatus as claimed in Claim 1 ~~any preceding claim,~~ wherein the programmable control means is also operably linked to the encapsulation section, to control movement of material through the encapsulation section.

8. Apparatus as claimed in Claim 7, wherein a servo motor operably linked to the programmable control means controls movement of the material through the encapsulation section, such that said material is advanced in increments corresponding to the desired pocket width.

9. Apparatus as claimed in Claim 1 ~~any preceding claim,~~ wherein the means by which the springs are transferred to the encapsulation unit and inserted between the sheets of material comprises

a rotating wheel with radially extending arms, successively formed springs being engaged by successive arms of said wheel;

means for compressing the springs as they are conveyed to the encapsulation section on the arms of said rotating wheel; and

a reciprocating cassette into which the compressed springs are delivered by said wheel and within which the compressed springs are transported to the encapsulation section.

10. Apparatus as claimed in Claim 1 ~~any preceding claim,~~ which further comprises ultrasonic welding means by which the sheets of material are joined together to form pockets.

11. Apparatus as claimed in Claim 10, wherein said ultrasonic welding means comprises longitudinal welding means arranged parallel to the longitudinal axis of the sheets of material and transverse welding means arranged transverse to said axis.

12. Apparatus as claimed in Claim 10 ~~or Claim 11~~, wherein said ultrasonic welding ~~means comprises ultrasonic welding horns with castellated lower edges.~~

~~13. Apparatus as claimed in Claim 11, wherein said transverse welding means comprises~~ a pair of welding horns arranged colinearly.

14. Apparatus as claimed in Claim 12 ~~or Claim 13~~, wherein means are provided for alteration of the position of the transverse welding means on said longitudinal axis of said sheets of material.

15. Apparatus as claimed in ~~any one of Claims 10 to 13~~ Claim 10, wherein the ultrasonic welding means comprise ultrasonic welding horns, at least one of which acts against a fixed anvil ~~provided with a surface coating which acts as a cushion for said welding horn.~~

16. Apparatus as claimed in Claim 15, wherein said surface coating comprises a tape applied to the surface of the anvil.

17. Apparatus as claimed in Claim 16, wherein said tape is a polytetrafluoroethylene tape.

~~18. Apparatus as claimed in any preceding claim~~ Claim 1, wherein said sheets of material are drawn through the encapsulation section by means of a pair of horizontally disposed rollers, ~~one of which is driven by a servo motor controlled by the programmable control means.~~

19. Apparatus as claimed in Claim 18, wherein said rollers have rubberised surfaces.

~~20. Apparatus as claimed in any preceding claim~~ in 1, ~~wherein said encapsulation section~~ comprises transport means for drawing said sheets of material incrementally through the encapsulation section and welding means for welding the sheets of material together,

wherein the transport means and the welding means are controlled by the ~~programmable control means.~~

21. A method of producing pocketed coil springs, which method comprises the steps of

a) setting the positions and/or orientations of coiling elements in the coiling section of apparatus as claimed in any preceding claim,

b) feeding wire through the coiling section so as to form a coil,

c) separating said coil from said wire,

d) compressing said coil,

e) inserting said coil between juxtaposed sheets of material, and

f) joining said sheets of material together so as to encapsulate said coil.

22. A method as claimed in Claim 21, wherein the positions and/or orientations of the coiling elements are set in accordance with a data array stored in the programmable control means.

23. A method as claimed in Claim 21 or Claim 22, wherein the positions and/or orientations of the coiling elements are set by servo motors operating under control of the programmable control means.

24. A pocketed coil spring assembly produced in accordance with the method of Claim 21 any one of Claims 21 to 23.

25. Apparatus for the production of pocketed coil springs, comprising

a coiling section in which a coil is formed from wire fed to the coiling section, said coiling section comprising coiling elements whose position and/or orientation determines the form of said coil, and

an encapsulation section in which the coil is inserted between juxtaposed sheets of material and in which the sheets of material are joined together to form a pocket enclosing the coil,

wherein said encapsulation section comprises at least one ultrasonic welding horn arranged parallel to the longitudinal axis of the sheets of material, and a plurality of transverse welding horns arranged colinearly and transverse to the longitudinal axis of the

sheets of material.

26. Apparatus as claimed in Claim 25, wherein means are provided for alteration of the position of the position of the transverse welding horns on said longitudinal axis of said sheets of material.

27. Apparatus as claimed in Claim 25 ~~or Claim 26~~, wherein at least one of said ultrasonic welding horns acts against a fixed anvil provided with a surface coating which acts as a cushion for said welding horn.

28. Apparatus as claimed in Claim 27, wherein said surface coating comprises a tape applied to the surface of the anvil.

29. Apparatus as claimed in Claim 28, wherein said tape is a polytetrafluoroethylene tape.

30. A method of producing pocketed coil springs, which method comprises inserting a compressed coil spring between juxtaposed sheets of material, and joining said sheets together by means of ultrasonic welds arranged parallel to and transverse to the longitudinal axis of said sheets so as to encapsulate said spring therebetween, wherein the ultrasonic welds transverse to the longitudinal axis of said sheets are formed by a plurality of ultrasonic welding horns with their lower edges arranged colinearly.

31. A method as claimed in Claim 30, wherein the lower edges of the welding horns are castellated.

32. A pocketed coil spring assembly produced in accordance with the method of Claim 30 ~~or Claim 31.~~

33. Apparatus for the production of pocketed coil springs, comprising

a coiling section in which a coil is formed from wire fed to the coiling section, said coiling section comprising coiling elements whose position and/or orientation determines the form of said coil, and

an encapsulation section in which the coil is inserted between juxtaposed sheets of material and in which the sheets of material are joined together to form a pocket enclosing the coil,

wherein said encapsulation section comprises at least one ultrasonic welding horn which acts against a fixed anvil provided with a surface coating which acts as a cushion for said welding horn.

34. Apparatus as claimed in Claim 33, wherein said surface coating comprises a tape applied to the surface of the anvil.

35. Apparatus as claimed in Claim 34, wherein said tape is a polytetrafluoroethylene tape.

36. Apparatus as claimed in ~~any one of Claims 33 to 35,~~ Claim 33 comprising at least one ultrasonic welding horn arranged parallel to the longitudinal axis of the sheets of material, and a pair of welding horns arranged colinearly and transverse to the longitudinal axis of the sheets of material.

37. Apparatus for the production of pocketed coil springs, comprising

a coiling section in which a coil is formed from wire fed to the coiling section, said coiling section comprising coiling elements whose position and/or orientation determines the form of said coil, and

an encapsulation section in which the coil is inserted between juxtaposed sheets of material and in which the sheets of material are joined together to form a pocket enclosing the coil,

wherein there are provided magnetic means at an exit of the coiling section, which magnetic means engage the coil so as to damp oscillation thereof.

38. Apparatus as claimed in claim 37, wherein said magnetic means comprises one or more electromagnets.

39. Apparatus as claimed in claim 37 ~~or claim 38~~, wherein the coil is mechanically drawn from the magnetic means as it is conveyed from the coiling section to the encapsulation section.

40. A pocketed spring assembly having a depth of 20cm or more.